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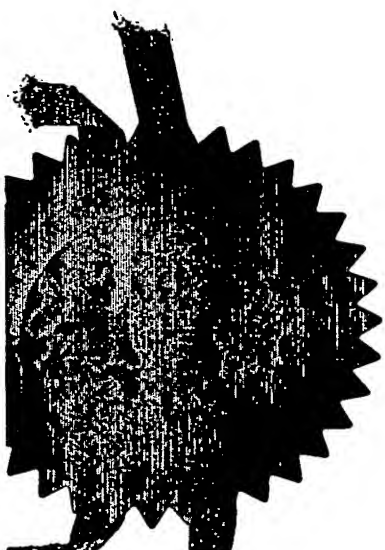
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McKenzie

Dated 19 August 2004



Patents Form 1/77

Patents Act 1977  
(Rule 16)THE PATENT OFFICE  
RN  
11 JUL 200311 JUL 03 E821753-1 C075862  
P0127700 0.00-0316192.4

## Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road  
Newport  
South Wales  
NP10 8QQ

## 1. Your reference

3DHYDRO / 03

## 2. Patent application number

(The Patent Office will fill in this part)

0316192.4

11 JUL 2003

## 3. Full name, address and postcode of the or of each applicant (underline all surnames)

University of Leeds  
Woodhouse Lane  
Leeds, LS2 9JT

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

ENGLAND

5916168004

## 4. Title of the invention

HYDRO LINK SPACER FABRICS

## 5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Harrison Goddard  
Foota  
21 St. Saviourgate  
York YO1 8NQRAYMOND WOLFSON  
IPMU  
UNIVERSITY OF LEEDS  
3 CAVENDISH ROAD  
LEEDS, LS2 9JT

Patents ADP number (if you know it) (P0117)

5916168005

## 6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)Date of filing  
(day / month / year)

N/A

## 7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

N/A

## 8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

YES

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9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	NONE
Description	THREE ✓
Claim(s)	NONE
Abstract	NONE
Drawing(s)	ONE ✓

10. If you are also filing any of the following, state how many against each item.

Priority documents	NONE
Translations of priority documents	NONE
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	NONE
Request for preliminary examination and search (Patents Form 8/77)	NONE
Request for substantive examination (Patents Form 10/77)	NONE
Any other documents (please specify)	NONE drawing included in description

11.

I/We request the grant of a patent on the basis of this application.

Signature

R. W. H. J.

Date 11/07/03

12. Name and daytime telephone number of person to contact in the United Kingdom

RAYMOND WOLFSON  
013 343 7261

## Warning

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## Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 600505.
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Patents Form 1/77

## Hydro Link Spacer Fabrics

June 2001 NRG, University of Leeds

### Background

The formation of nonwoven materials with a three-dimensional structure has been reported previously (USP5674591:1994, EP0692564:1996, EP0605015:1992, USP0447090:1990, USP165979:1990, USP5066538:1991, EP0977914:2000).

Le Roy described a method (USP 5475904, which is known commercially as the NAPCO system) for producing 3D structures by joining two or three fibrous materials together with a space left between the basic layers. The layers of fibrous materials can be woven, knitted, nonwoven or a combination of these. Barbed needles operating between two stripper plates transfer fibres from one layer to another to form links or bridges between separate layers. Alternatively, it is claimed that joining the layers can be achieved by stitching or ultrasonic welding. The two layers are kept a predetermined distance apart by a spacer plate. The spacer plate and stripper plates are adjustable by hand wheels and allow structures ranging in thickness from 5 to 50 mm to be made. Filling materials can be introduced between the two basic layers, which may be resin, powder, fibres, tubes, wire, threads, and/or electrical conductors. It is claimed that various different structures can be more economically formed using this approach compared to conventional methods. The 3D materials produced can be used in drainage, reinforcement, and insulation applications.

The use of needlepunching to interconnect layers as described by Le Roy (USP5475904) limits the speed of production to a maximum of about 10m/min (USP5475904) and generally there are limitations in simultaneously bonding and connecting layers in lightweight fabrics below 100 g/m<sup>2</sup>. In this way, a preconsolidated web structure is normally required which tends to increase the cost of production. A further limitation of the existing method is the possibility of needle breakage, which has a deleterious effect on fabric quality and product acceptance in critical applications (e.g. contact layers used in woundcare).

We have unexpectedly discovered a method of overcoming these problems using an alternative approach that relies on the use of fluid jets to interconnect fibres through a spacer system.

### Summary of the Invention

The new approach involves the use of fine columnar water jets (of ca. 80 - 200 micron diameter) and a spacer system to either:

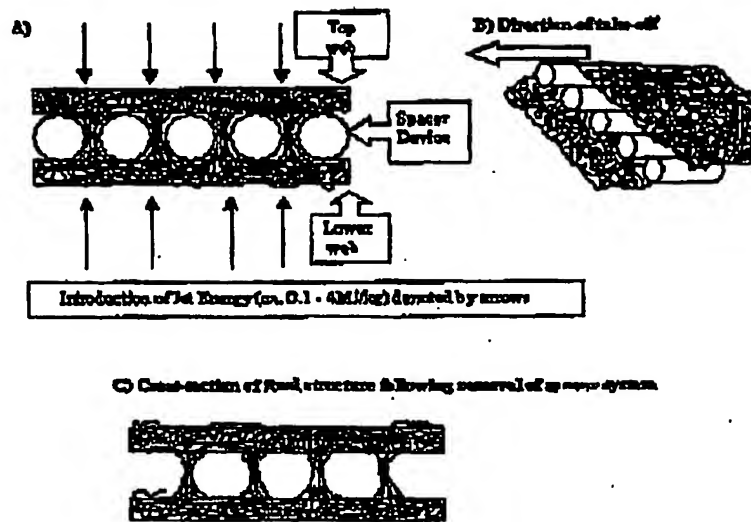
- 1) Simultaneously bond and inter-connect separate layers of web to produce an integrated 3D structure with engineered internal architectures.
- 2) Interconnect fibres in a pre-bonded structure to achieve similar architectures.

In the new approach webs (containing textile fibres) formed by carding, carding and lapping, air-laid, melt-blowing or spunlaid methods are introduced either side of a spacer device which keeps the webs apart. A basic diagram of the approach is shown



components can be introduced in to the cross-section of the fabric by introducing such materials in to the centre of the spacer elements (assuming they are hollow). This provides a simple and convenient method of producing composite structures containing resins, filaments, yarns, solutions, cable, pharmaceuticals, powders, etc.

**Figure 1 Schematic of Formation System a) End-on cross-sectional view b) Side view c) Final structure**



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